PHYSICS 106 (Spring 2005)
EXAM 2 – VERSION A

NAME_____   RECITATION _____

INSTRUCTIONS:

- Please fill in your computer answer sheet filling in the circle on the sheet corresponding to the letters of numbers with a #2 pencil as follows:

    In the NAME grid fill in your last name, leave one blank space, then your first name.

    Write your ID number in the IDENTIFICATION NUMBER section of the sheet.

    Write your recitation section number in the space K,L in the SPECIAL CODES section. The recitation section number should be preceded by a 0 (e.g. section 1 is written as 01).

    Fill in the VERSION of this exam on #102 of the answer sheet.

    In the next fifty minutes you need to answer all 20 questions for 5 points each. For each question, you should indicate in the answer sheet the best choice. Note that the multiple-choice questions on this exam are numbered 21 through 40. Check your answers carefully, making sure your answers are entered under the correct number, as no changes will be made after the exam is turned in. At the end of the exam you will have to hand in your notes, your exam paper and the answer sheet.

You are allowed to use one page of handwritten notes. NO calculator is allowed.

21.   The gauge pressure in the tires of a car is 300 kPa. The area of each tire in contact with the road is 100 cm^2. What is the mass of the car in kg?

A.   240 kg
B.   480 kg
C.   960 kg
D.   1200 kg
E.   1480 kg

22.   A penny has a mass of 3.14 g, a diameter of 2.0 cm, and a thickness of 0.1 cm. What is the density, in g/cm^3, of the metal which is made?

A.   1.57
B.   3.14
C.   10.0
D.   15.0
E.   31.4

23.   While studying for this quiz you realize that you still have 100 g of lukewarm coffee at 40° C left in a paper cup. When you pour 50 g of boiling water into the cup, the temperature of the resulting coffee-like mixture will be now

A.   50 °C.
B.   60 °C.
C.   67 °C.
D.   70 °C.
E.   80 °C.

24.   The temperature in January in Winnipeg, Canada has been known to go down to -40° C. What is this temperature on the Fahrenheit scale?

F.   -40 °F
G.   -104 °F
H.   -10 °F
I.   -72 °F
J.   -32 °F

25. The temperature of a 50 g sample of aluminum is raised from 20 °C to 90 °C when 770 cal of heat is added. The specific heat capacity of the aluminum is

   A.   Not calculable from this data
   B.   0.11 cal/g °C.
   C.   15.4 cal/g °C.
   D.   0.22 cal/g °C.
   E.   0.91 cal/g °C.

26. A glass is filled with water. The pressure at the top of the glass is zero and the bottom is P. A second glass having three times the height and twice the diameter is also filled with water. What is the pressure at the bottom of the second glass?

   A.   P
   B.   2P
   C.   3P
   D.   3P/2
   E.   3P/4

27. A metal block suspended from a spring balance is submerged under water. It is observed that the block displaces 80 cm^3 of water and the spring balances reads 4.0 N. What is the density in g/cm^3 of the block? (This is the method that Archimedes used to find out if the crown of the king was really from gold)

   A.   4
   B.   6
   C.   8
   D.   10
   E.   11

28. If electrical energy costs 10 cents per kilowatt-hour, how many cents does it cost to keep a 600-watter toaster in steady operation for 30 minutes at a voltage of 120 volts?

   A.   18 cents
   B.   12 cents
   C.   6 cents
   D.   3 cents
   E.   1 cent

29. When two resistors are connected in series, the equivalent resistance is Rs = 9 Ω When they are connected in parallel, the equivalent resistance is Rp =2 Ω. What are the values of the two resistances?

    A.   1Ω and 8 Ω
    B.   2 Ω and 7 Ω
    C.   3 Ω and 6 Ω
   D.   4 Ω and 5 Ω
    E.   Both 4.5 Ω

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30. If the magnetic field vector is directed toward the north and a positively charged particle is moving toward the east, what is the direction of the magnetic force on the particle?

    A.   Up
    B.   West
    C.   South
    D.   Down
    E.   East

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31. Two wires lie in the plane of the paper and carry equal currents in opposite directions as shown. At a point midway between the wires the magnetic field is
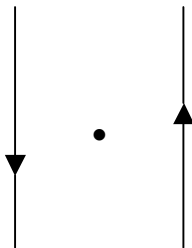
    A.   zero.
    B.   into the page.
    C.   out of the page.
    D.   toward the top or bottom or the page.
    E.   toward one of the two wires.

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32. If 500 J is required to carry a 50 C charge from one point to another, the potential difference between these two points is

    A.   50 V
    B.   500 V
    C.   10 V
    D.   25,000 V
    E.   zero

33. Faraday's law states that an induced voltage (emf) is proportional to

    A.   the rate of change of the magnetic field.
    B.   the rate of change of the electric field.
    C.   the rate of change of the magnetic flux.
    D.   the rate of change of the electric flux.
    E.   zero.

34. A calculator typically uses 6.0 V for its operation. If, instead of using batteries, you obtain this 6.0 V from a transformer plugged into 120-V house wiring, what must be the ratio of the primary to the secondary turns of the transformer?

    A.   200
    B.   120
    C.   60
    D.   40
    E.   20

35. How would the maximum voltage (emf) produced by a generator (a rotating coil) be changed if the period of rotation were doubled?

    A.   It would be the same
    B.   It would be doubled
    C.   It would be quadrupled
    D.   It would be halved
    E.   It would be quartered

36. Two equal positive charges are near each other. If we decrease the amount of charge on just one of them, then

   A.   both charges feel an increased electrical force.
   B.   only smaller charge feels an increased electrical force.
   C.   the electric field felt by both charges increases.
   D.   the electric field felt by the smaller charge increases.
   E.   both answers A and D.

37. Comparing the electrostatic force and the gravitational force we can say that

   A.   both have the same dependence on distance, both involve attraction and repulsion but the gravitational force is stronger.
   B.   both have the same dependence on distance, both involve attraction and repulsion but the electrostatic force is stronger.
   C.   both have the same dependence on distance, the electrostatic force can be either attractive or repulsive while the gravitational force is only repulsive, and the electrostatic force is weaker.
   D.   both have the same dependence on distance, the electrostatic force can be either attractive or repulsive while the gravitational force is only attractive, and the electrostatic force is stronger.
   E.   the electrostatic force falls off more rapidly with distance, the electrostatic force can be either attractive or repulsive while gravitation is only attractive and the electrostatic force is stronger.

38. A -10 μC charge is at the origin. A +5 μC charge is on the x-axis 10 cm to the right of the origin. At what point other than at infinity can a 1 μC charge be placed so that there will be no net electrostatic force on it?

   A.   At one point between the two charges.
   B.   At one point on the x-axis to the right of the positive charge.
   C.   At one point on the x-axis to the left of negative charge.
   D.   At some point off the x-axis either above or below.
   E.   At no point.

39. A household circuit rated at 120 Volts is protected by a fuse rated at 15 amps. What is the maximum number of 60 Watt light bulbs which can be lit simultaneously in parallel in this circuit without blowing the fuse?

    A.   10
    B.   20
    C.   30
    D.   40
    E.   50

40. A vertical straight wire carries a current from south to north. The resulting magnetic field lines are

    A.   parallel to the wire from south to north
    B.   parallel to the wire from north to south
    C.   closed circles perpendicular to the wire directed clockwise as viewed from the south.
    D.   closed circles perpendicular to the wire directed counterclockwise as viewed from the south.
    E.   straight lines perpendicular to the wire.